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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
08/880,616	06/23/97	COHEN M	YO997-111

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EXAMINER	
FOURSON, G	
ART UNIT	**PAPER NUMBER**
2755	24

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trad marks

Office Action Summary	Application No. 08/880,616	Applicant(s) Cohen et al.
	Examiner Gary Fourson	Group Art Unit 2755

☒ Responsive to communication(s) filed on *Mar 9, 1999*.

☒ This action is **FINAL.**

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire *3* month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) *1-18* is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) *1-18* is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐approved ☐disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____.

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

DETAILED ACTION

This final rejection is responsive to Amendment A, received March 9, 1999.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 15 and 16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 15 recites the limitation "said remotely located scheduler" in lines 2-3. There is insufficient antecedent basis for this limitation in the claim. Claim 16 is rejected due to the dependence on claim 15. Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 2, 4-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cameron et al. (5,325,526) in view of Admitted Prior Art (Applicant's Specification page 2 line 20 through page 3 line 7).

With respect to claim 1, Cameron et al. teaches computing nodes with a plurality of local processes (processors P1, P2, and P3; column 7 line 36, "... more than one application program may be loaded on a single node." Column 7, beginning on line 53 teaches, "A partition in the present invention is an object comprising a plurality of items of information and optionally related processing functions for maintaining a logical environment for the execution of tasks of one or more application programs."), scheduler means (scheduler 410, 510, or 612), and dynamically creating a schedule of tasks utilizing priorities (column 14 lines 33-42: interactive scheduling). However, Cameron et al. does not teach a local scheduler comprising means for ascertaining which process(es) are assigned to the tasks nor means for prioritizing the processes.

Applicant has divulged on pages 2-3 that the AIX™ operating system assigns a common priority to the process(es) required for (or correlated to) a task. Having the processes associated with individual tasks assigned priority corresponding to the priorities of the individual tasks would have been a highly desirable feature in the art. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the process priority information of IBM into the task scheduling system of Cameron et al., because correlating local processes with the current or next task would have been expected to result in higher cache preloading efficiency.

With respect to claim 11, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claim 1 teaches the limitations of claim 11 substantially as claimed except providing application information to the scheduler means: Cameron et al. teaches in columns 7 and 8 an allocator and scheduler component (612 and 710). Figure 7 shows procedures (720, 722, 724, 726, 728, 740, 742, and 744) for the Allocator and Scheduler. Block 736 represents application data which inherently must have been transmitted to the allocator/scheduler.

As to **claim 2**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claim 1 teaches the limitations of claim 11 substantially as claimed except said computing node comprising an operating system for "receiving input" from the prioritizing means and "directing said assigned processes" to execute tasks in a prioritized order: Cameron et al. in Figures 4 and 5 show a prior art task scheduler. Column 5 last paragraph elaborates stating that each scheduler comprises operating system software responsible for controlling the execution of a plurality of tasks. It would have been obvious to one ordinarily skilled in the art at the time the invention was made for the OS to receive information about the execution of the plurality of tasks, because Cameron et al. states in column 6 lines 28-31, "Interactive scheduling using Unix, or other operating systems in a single processor environment, is well known to those of ordinary skill in the art."

As to **claim 4**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1 and 2 teaches the limitations substantially as claimed except application coordinator means for communicating information to said scheduler: Scheduling information must inherently be obtained by some means in order to produce a prioritized list of tasks, however in column 8, Cameron et al. teaches on line 2, "The allocator and scheduler 710 comprises processing logic and data for allocating nodes to specific application programs and for scheduling applications programs for execution." The "Make Partition" procedure (720) is the request for the allocator/scheduler to initialize tasks which as stated on line 18, "are retrieved and loaded into the nodes associated with the specified partition."

As to **claim 5**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1 and 2 teaches the limitations substantially as claimed except said local processes being adapted to perform tasks in parallel: Multi-tasking, round robin processing, time slicing, or parallel processing was well known to one of ordinary skill in the art at the time the invention was made as indicated in Cameron et al. in column 1 on lines 26 to 30. Also, in column 2 on line 50 Cameron teaches that application programs are allowed to execute on one or more nodes of a partition. Furthermore, column 7 line 40 states, "...an entire application program is active at once across all of the nodes on which the application program is loaded." The multi-node or multi-processor

collaborative effort to the processing of a set of tasks or application program processes is the truest definition of parallel processing.

As to **claim 6**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claim 1 teaches the limitations substantially as claimed except said scheduler means comprising global scheduler means which in turn comprises means for dynamically scheduling then communicating the schedule to the local scheduler: Cameron et al. teaches the local nodes and partitions which are assigned to application programs. The allocator and scheduler 612 act functionally as a "global scheduler" by controlling and assigning the appropriate nodes from a particular layer. Column 7 line 50 states, "As will be described below, allocator and scheduler 612 may and typically does operate with a plurality of partitions 614." In column 9 on line 50, "In the preferred embodiment, partition data blocks and application data blocks can be maintained in the same doubly-linked list." Further down on line 64 it is stated that, "The current priority field 918 may dynamically change as the priorities of associated application programs or sub-partitions change priority."

As to **claim 7**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1 and 6 teaches the limitations substantially as claimed except said local scheduler being adapted to communicate process information to the global

scheduler: Cameron et al. teaches in column 14 lines 12-31 three access modes to the partition data. They are read,

write, and execute access modes allowing or disallowing the ability to run application programs from a partition and to create or remove sub-partitions from a partition. This information is also available to the allocator/scheduler 710. Also, figure 7 shows application data 736 specifically available to the allocator/scheduler.

As to **claim 8**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1 and 6 teaches the limitations substantially as claimed except the global scheduler also comprising timer means to effect schedule communication: Cameron et al. teaches in column 11 lines 6-11 a time executed field 1021.

As to **claim 9**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1 and 6 teaches the limitations substantially as claimed except said global scheduler including a local scheduler address table: Cameron et al. teaches in column 13 lines 15-33, "Two hash tables providing a quick look-up mechanism for locating partitions ..."

As to **claim 10**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1, 2, and 6 teaches the limitations substantially as claimed.

As to **claim 12**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1 and 11 teaches the limitations substantially as claimed except

invoking operating system priorities to schedule tasks in accordance with said prioritized schedule: The operating system would inherently follow any prioritizing scheme employed by the programmer or else there would not be any need to incorporate the local/global scheduling means in the first place.

As to **claim 13**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1 and 11 teaches the limitations substantially as claimed except scheduler means is remote to the node and communicating the schedule to the node: Cameron et al. shows in Figures 4 and 5 that in prior art methods of task management systems, the Scheduler 410, 510 can be remotely located from the processors. In column 6 lines 32-45 refer specifically to Figure 5 noting that the scheduler arranges an orderly schedule for multiple tasks executing on multiple processors. Line 37 mentions a common memory where the schedule information would be communicated to the three processing nodes.

As to **claim 14**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1, 5, 11, and 12 teaches the limitations substantially as claimed.

As to **claim 15**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1, 11, 12, and 14 teaches the limitations substantially as claimed except communicating task execution information to the scheduler: Cameron et al. teaches in column 11 lines 6-11 a time executed field 1021. This "execution

information" is part of a process group field 1020 which is updated and available to the scheduler.

As to **claim 16**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1, 5, 11, 12, 14, and 15 teaches the limitations substantially as claimed except repeating said steps until all tasks have been completed: Cameron teaches recursive scheduling in column 15 on lines 12-14.

5. Claims 3 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cameron et al. as modified by Applicant's Admitted Prior Art as applied to claims 2 and 14 above, and further in view of Ripps (The Multitasking Mindset Meets the Operating System).

As to **claim 3**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1 and 2 teaches the limitations of claim 11 substantially as claimed except the operating system being further adapted to interleave local operations with said tasks: A node or CPU controlled by an operating system would inherently process local operations (e.g. an exception) pertaining to the operating system commands. Ripps teaches on page 9 that C and proprietary OS functions are intermixed in a typical task. Context switches controlled by the operating system are also well known local tasks which are interleaved between the application task execution.

As to **claim 17**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 1, 3, 5, 11, 12, and 14 teaches the limitations substantially as claimed.

6. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cameron et al. as modified by Applicant's Admitted Prior Art as applied to claim 12 above, and further in view of Belo (5,379,428).

As to **claim 18**, Cameron et al. in view of Admitted Prior Art as modified for the rejection of claims 16, 11, and 13 teaches the limitations substantially as claimed except said remotely located scheduler dynamically maintaining a computing node's list: The apparatus of Cameron dynamically partitions the nodes for application tasks (Figure 7, Schedule Partition 740) then removes partitions (724) when necessary. However, Cameron et al does not explicitly show the list for each node being dynamically manipulated by the allocator/scheduler 710.

Belo teaches a parallel processing computer system. Figure 1 shows a process scheduler and process interrupter 10 encompassing cluster schedulers 20 (a, b, c, ...N). Column 4, line 34 states, "Each cluster scheduler independently schedules processes for the processors in the cluster it serves." Cluster schedulers have a maximum of 255 different process priorities as seen further down on line 42. In column 5 it is taught that the next register will latch the highest waiting process priority number after one of the processors of a cluster becomes available and has assumed operation on the process

formerly pointed to by this next register. Though not explicitly labeled as such, each cluster scheduler is functionally equivalent to a local scheduler where new tasks are presented and entered into the 255 maximum task entry list. The hardware apparatus of Belo replaces a software version, and there is no distinction between hardwired and coded logic. The dynamic list maintenance of Belo would have been a highly desirable feature in the multi computer processing art. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the more elaborate scheduling scheme of Belo, because greater quantities of task processing power would be expected as suggested by Belo in column 4 lines 39-48.

Response to Amendment

7. Applicant's arguments filed March 9, 1999 have been fully considered, but they are not persuasive.

Section 103: Applicant has presented the following arguments:

"The present invention, in contrast, provides for multiple tasks of multiple applications being active on the multiple processes of any given node at a time." Applicant has thus amended the independent claims to indicate that scheduling is provided for "a plurality of tasks of *more than one* application in at least one computing node," and the Examiner agrees that it is stated by Cameron et al. that only one application program or consumer assigned to a layer will be active on the nodes dedicated

to that *layer* at any one time. However, multitasking systems such as WINDOWS NT™ have been well known to schedule tasks or threads of execution from multiple applications simultaneously.

As shown in Applicant's Figure 8, the tasks of each consumer occupy the nodes for the given time slot. Cameron et al. teach time constraints on how long a consumer, or application, may use the resources, or nodes, of any given layer until a context switch will occur. Context switching is the saving of the previous and restoring of the next tasks states. Cameron et al. state in col. 3 line 62, "It is, therefore, an object of the present invention to provide a multicomputer task scheduler using logical processor (node) partitioning in which sets of nodes are assigned to partitions, and in which a node may be assigned to one or more partitions at a time, and in which one or more applications may be executed within a partition, and in which a node may have one or more applications loaded on it. It is a further object of the present invention to provide a multicomputer task scheduler allowing the scheduling of one or more applications within a partition..."

Furthermore, the Cameron reference teaches that the processor complex is divided into partitions. Column 7, beginning on line 53 teaches, "A partition in the present invention is an object comprising a plurality of items of information and optionally related processing functions for maintaining a logical environment for the execution of tasks of one or more application programs." Examiner respectfully submits that the

layers described in column 11 contain a consumer or application, but the system can have multiple layers and therefore multiple applications running and being scheduled simultaneously.

Applicant argues lack of local scheduler among a plurality of nodes, however, the claim language states "at least one computing node," which is satisfied by there being one node. The tasks of Cameron et al. are given priorities which correspond to the priorities of the consumers or application.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Pertinent Prior Art

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

a. Vanderah et al. (5,339,425) teach an Operating System For a Process Controller.

b. Fletcher et al. (5,012,409) teach an Operating System for a Multi-Tasking Operating Environment.

c. Zolnowsky teaches a Real Time Thread Dispatcher for Multiprocessor Applications.

d. Helen Custer (Inside WINDOWS NT™: chapter four) teach processes and threads.

Conclusion

Any inquiry concerning this communication should be directed to **Gary Fourson** at telephone number **(703) 305-4392** or E-mail at the address **gary.fourson@uspto.gov**.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 305-9600.

The fax numbers for formal (703-308-9051), to be intended for entry into the application, or informal (703-305-9731) communications may be utilized for expedited transactions.

gsf

May 18, 1999

ALVIN E. OBERLEY
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